# I PHONE

1. The **I Phone** is a line of Internet and multimedia enabled smart phones marketed by Apple. The first iPhone was unveiled by former Apple CEO Steve Jobs on January 9, 2007 and released on June 29, 2007. An iPhone can function as a video camera (video recording was not a standard feature until the iPhone 3GS was released), a camera phone, a portable media player, and an Internet client with email and web browsing capabilities, can send texts and receive visual voicemail, and has both Wi-Fi and 3G connectivity. The user interface is built around the device's multi-touch screen, including a virtual keyboard rather than a physical one. These apps have diverse functions, including games, reference, GPS navigation, social networking, security and advertising for television shows, films, and celebrities.

2. There are four generations of iPhone models, each accompanied by one of the four major releases of iOS (formerly iPhone OS). The original iPhone was a GSM phone that established design precedents like screen size and button placement that have persisted through all models. The iPhone 3G added 3G cellular network capabilities and A-GPS location. The iPhone 3GS added a compass, faster processor, and higher resolution camera, including video recording.

## History and Availability

3. Development of the iPhone began in 2005 with Apple CEO Steve Jobs' direction that Apple engineers investigate touch screens. He also steered the original focus away from a tablet, like the iPad, and towards a phone. Apple created the device during a secretive collaboration with AT&T Mobility—Cingular Wireless at the time—at an estimated development cost of US $150 million over thirty months. Apple rejected the "design by committee" approach that had yielded the Motorola ROKR E1, a largely unsuccessful collaboration with Motorola. Instead, Cingular gave Apple the liberty to develop the iPhone's hardware and software in-house and even paid Apple a fraction of

its monthly service revenue (until the iPhone 3G in exchange for four years of exclusive U.S. sales, until 2011.

4. Jobs unveiled the iPhone to the public on January 9, 2007 at the Macworld 2007 convention at the Moscone Center in San Francisco. The iPhone went on sale in the United States on June 29, 2007, at 6:00 pm local time, while hundreds of customers lined up outside the stores nationwide. The original iPhone was made available in the UK, France, and Germany in November 2007, and Ireland and Austria in the spring of 2008.

5. On July 11, 2008, Apple released the iPhone 3G in twenty-two countries, including the original six. Apple released the iPhone 3G in upwards of eighty countries and territories. Apple announced the iPhone 3GS on June 8, 2009, along with plans to release it later in June, July, and August, starting with the U.S., Canada and major European countries on June 19. Many would-be users objected to the iPhone's cost, and 40% of users have household incomes over US$100,000 In an attempt to gain a wider market, Apple retained the 8 GB iPhone 3G at a lower price point. When Apple introduced the iPhone 4, the 3GS became the less expensive model. Apple reduced the price several times since the iPhone's release in 2007, at which time an 8 GB iPhone sold for $599. An iPhone 3GS with the same capacity now costs $49. However, these numbers are misleading, since all iPhone units sold through AT&T require a two-year contract (costing several hundred dollars and including an early termination fee), and a SIM lock.

6. Apple sold 6.1 million original iPhone units over five quarters Recorded sales have been growing steadily thereafter, and by the end of fiscal year 2010, a total of 73.5 million iPhones were sold By 2010/2011, the iPhone has a market share of barely 4% of all cellphones, but Apple still pulls in more than 50% of the total profit that global cellphone sales generate Sales in Q4 2008 surpassed temporarily those of RIM's BlackBerry sales of 5.2 million units, which made Apple briefly the third largest mobile phone manufacturer by revenue, after Nokia and Samsung. Approximately 6.4 million iPhones are active in the U.S. alone. While iPhone sales constitute a significant portion of Apple's revenue, some of this income is deferred.

7. On January 11, 2011, Verizon announced during a media event that it had reached an agreement with Apple and would begin selling a CDMA2000 iPhone 4. Verizon said it would be available for pre-order on February 3, with a release set for February 10. In February 2011, the Verizon iPhone accounted for 4.5 percent of all iPhone ad impressions in the U.S. on Millennial Media's mobile ad network On March 2, 2011, at the iPad 2 event, Apple announced that they have sold 100 million iPhones worldwide. Leveraging solid volumes and the iPhone's high selling price, Apple became the largest mobile handset vendor in the world, surpassing long-time leader Nokia.

## HARDWARE

### Screen and Input

8. The touch screen is a 9 cm (3.5 in) liquid crystal display with scratch-resistant glass. The capacitive touch screen is designed for a bare finger, or multiple fingers for multi-touch sensing. The screens on the first three generations have a resolution of

320 × 480 (HVGA) at 163 ppi, while that of iPhone 4 has a resolution of 640 × 960 at 326 ppi.

9. The touch and gesture features of the iPhone are based on technology originally developed by Finger Works. Most gloves and styluses prevent the necessary electrical conductivity. The iPhone 3GS and later also feature a fingerprint-resistant oleo phobic coating.

10. The top and side of the iPhone 3GS, externally identical to the iPhone 3G. The switches were black plastic on the original model. From left to right, sides: wake/sleep button, SIM card slot, headphone jack, silence switch, volume controls. Top: earpiece, screen.

11. The iPhone has a minimal hardware user interface, featuring only four or five buttons, depending on the generation. The only physical menu button is situated directly below the display, and is called the "Home button" because it closes the active app and navigates to the home screen of the interface. The home button is denoted not by a house, as on many other similar devices, but a rounded square, reminiscent of the shape of icons on the home screen. A multifunction sleep/wake button is located on the top of the device. It serves as the unit's power button, and also controls phone calls.

12. The display responds to three sensors (four on the iPhone 4). A proximity sensor deactivates the display and touch screen when the device is brought near the face during a call. This is done to save battery power and to prevent inadvertent inputs from the user's face and ears. An ambient light sensor adjusts the display brightness which in turn saves battery power. A 3-axis accelerometer senses the orientation of the phone and changes the screen accordingly, allowing the user to easily switch between portrait and landscape mode. Photo browsing, web browsing, and music playing support both upright and left or right widescreen orientations. Unlike the iPad, the iPhone does not rotate the screen when turned upside-down, with the Home button above the screen, unless the running program has been specifically designed to do so. The 3.0 update added landscape support for still other applications, such as email, and introduced shaking the unit as a form of input. The accelerometer can also be used to control third party apps, notably games. The iPhone 4 also includes a gyroscopic sensor, enhancing its perception of how it is moved.

13. A software update in January 2008 allowed the first-generation iPhone to use cell tower and Wi-Fi network locations trilateral, despite lacking GPS hardware. The iPhone 3G, 3GS and 4 employ A-GPS, and the iPhone 3GS and 4 also have a digital compass.

## Audio and Output

14. One of two speakers (left) and the microphone (right) surround the dock connector on the base of the original iPhone. If a headset is plugged in, sound is played through it instead. The bottom of the iPhone sports a speaker (left) and a microphone (right) flanking the dock connector. One loudspeaker is located above the screen as an earpiece, and another is located on the left side of the bottom of the unit, opposite a microphone on the bottom-right. The iPhone 4 includes an additional microphone at the top of the unit for noise cancellation, and switches the placement of the microphone and speaker on the base on the unit—the speaker is on the right. Volume controls are located on the left side of all iPhone models and as a slider in the iPod application.

15. The built-in Bluetooth 2.x+EDR supports wireless earpieces and headphones, which requires the HSP profile. Stereo audio was added in the 3.0 update for hardware that supports A2DP. While non-sanctioned third-party solutions exist, the iPhone does not officially support the OBEX file transfer protocol. The lack of these profiles prevents iPhone users from exchanging multimedia files, such as pictures, music and videos, with other bluetooth-enabled cell phones. Composite or component video at up to 576i and stereo audio can be output from the dock connector using an adapter sold by Apple. iPhone 4 also supports 1024x768 VGA output without audio, and HDMI output, with stereo audio, via dock adapters. The iPhone did not support voice recording until the 3.0 software update.

## Battery

16. The iPhone features an internal rechargeable battery. Like an iPod, but unlike most other mobile phones, the battery is not user-replaceable The iPhone can be charged when connected to a computer for synching across the included USB to dock connector cable, similar to charging an iPod. Alternatively, a USB to AC adapter (or "wall charger," also included) can be connected to the cable to charge directly from an AC outlet. A number of third-party accessories (car chargers, portable chargers, battery cases, stereo dock chargers, and even solar chargers) are also available.

17. Apple runs tests on preproduction units to determine battery life. Apple's website says that the battery life "is designed to retain up to 80 percent of its original capacity after 400 full charge and discharge cycles which is comparable to iPod batteries. The battery life of early models of the iPhone has been criticized by several technology journalists as insufficient and less than Apple's claims. If the battery malfunctions or dies prematurely, the phone can be returned to Apple and replaced for free while still under warranty. Though the battery replacement service and its pricing was not made known

to buyers until the day the product was launched it is similar to how Apple (and third parties) replace batteries for iPods.

**Camera**

18. The iPhone 4 is the first generation to have two cameras. The LED flash for the rear-facing camera (top) and the forward-facing camera (bottom) are both unique to that model. The original iPhone and iPhone 3G feature a built-in fixed focus 2.0 megapixel camera located on the back for still digital photos. It has no optical zoom, flash or autofocus, and does not support video recording (iPhone 3G does support video recording via third-party App available on the App Store), however jailbreaking allows users to do so. Version 2.0 of iPhone OS introduced the capability to embed location data in the pictures, producing geocoded photographs.

19. The iPhone 3GS has a 3.2 megapixel camera, manufactured by Univision, featuring autofocus, auto white balance, and auto macro (up to 10 cm). It is also capable of capturing 640x480 (VGA resolution) video at 30 frames per second, although compared to higher-end CCD based video cameras it does exhibit the rolling shutter effect. The video can then be cropped on the device itself and directly uploaded to YouTube, or other services.

20. The iPhone 4 introduced a 5.0 megapixel camera (2592x1936 pixels), also located on the back, which is equipped with a backside illuminated sensor capable of capturing pictures in low-light conditions, as well as an LED flash capable of staying lit for video recording at 720p resolution, considered high-definition iPhone 4 is the first iPhone that has the high dynamic range photography feature. In addition the iPhone 4 has a second camera on the front capable of VGA photos and SD video recording. Regardless of the source, saved recordings may be synched to the host computer, attached to email, or (where supported) sent by MMS. Videos may be uploaded to YouTube directly. Beta code pulled from iOS 5 suggests that the next feature to be released will allow users to capture a panoramic photo on their iPhone.

**Storage and SIM**

21. The iPhone was initially released with two options for internal storage size: 4 GB or 8 GB. On September 5, 2007, Apple discontinued the 4 GB models. On February 5, 2008, Apple added a 16 GB model. The iPhone 3G was available in 16 GB and 8 GB. The iPhone 3GS came in 16 GB and 32 GB variants and still is available in 8 GB. The iPhone 4 is available in 16 GB and 32 GB variants. All data is stored on the internal flash drive; the iPhone does not support expanded storage through a memory card slot, or the SIM card.

22. GSM Models of the iPhone use a SIM card to identify themselves to the GSM network. The SIM sits in a tray, which is inserted into a slot at the top of the device. The SIM tray can be ejected with a paperclip or the "SIM eject tool" (a simple piece of die-cut sheet metal) included with the iPhone 3G and 3GS In most countries, the iPhone is usually sold with a SIM lock, which prevents the iPhone from being used on a different mobile networks. The GSM iPhone 4 features a MicroSIM card that is located in a slot on the right side of the device. The CDMA model of the iPhone, like all CDMA phones, does not use a SIM.

**Liquid Contact Indicators**

23. The iPhone is equipped with liquid contact indicators which change from white to red in color when they come in contact with water. These suggest whether water damage has affected the device. The indicators on the iPhone include a small disc which is located at the bottom of the headphone jack and with the iPhone 3G and all later models an additional one is located at the bottom of the dock connector The indicators are often used by Apple employees to determine whether the device qualifies for a warranty repair or replacement. If the indicators show that the device was exposed to water, they may determine that the device is not covered by Apple.

24. However, the liquid contact indicators may be triggered through routine use, and if a device is worn while exercising, the sweat from an owner may dampen the indicators enough to indicate water damage. On many other mobile phones from different manufacturers, the liquid contact indicators are located in a protected location, such as beneath the battery behind a battery cover, but the indicators on an iPhone are directly exposed to the environment. This has led to criticism of the placement of the indicators, which may also be affected by steam in a bathroom or other light environmental moisture. In response to these criticisms, Apple made a silent change to their water damage policy for iPhones and similar products. This new policy allows the

customer to request further internal inspection of the phone to verify if internal liquid damage sensors were triggered.

## Included Items

25. All iPhone models include written documentation, and a dock connector to USB cable. The original and 3G iPhones also came with a cleaning cloth. The original iPhone included stereo headset (earbuds and a microphone) and a plastic dock to hold the unit upright while charging and syncing. The iPhone 3G includes a similar headset plus a SIM eject tool (the original model requires a paperclip). The iPhone 3GS includes the SIM eject tool and a revised headset, which adds volume buttons (not functional with previous iPhone versions). The iPhone 3G and 3GS are compatible with the same dock, sold separately, but not the original model's dock. All versions include a USB power adapter, or "wall charger," which allows the iPhone to charge from an AC outlet. The iPhone 3G and iPhone 3GS sold in North America, Japan, Colombia, Ecuador, or Peru include an ultracompact USB power adapter.

## Interface

26. The interface is based around the home screen, a graphical list of available applications. iPhone applications normally run one at a time (not including iOS 4, which includes running applications in the background although most functionality is still available when making a call or listening to music. The home screen can be accessed at any time by a hardware button below the screen, closing the open application in the process. By default, the Home screen contains the following icons: Messages (SMS and MMS messaging), Calendar, Photos, Camera, YouTube, Stocks, Maps (Google Maps), Weather, Voice Memos, Notes, Clock, Calculator, Settings, iTunes (store), App Store, and (on the iPhone 3GS and iPhone 4) Compass. Docked at the base of the screen, four icons for Phone, Mail, Safari (Internet), and iPod (multimedia) delineate the iPhone's main purposes. On January 15, 2008, Apple released software update 1.1.3, allowing users to create "Web Clips", home screen icons that resemble apps that open a user-defined page in Safari. After the update, iPhone users can rearrange and place icons on up to nine other adjacent home screens, accessed by a horizontal swipe. Users can also add and delete icons from the dock, which is the same on every home screen. Each home screen holds up to sixteen icons, and the dock holds up to four icons. Users can delete Web Clips and third-party applications at any time, and may select only certain applications for transfer from iTunes. Apple's default programs, however, may not be removed. The 3.0 update adds a system-wide search, known as Spotlight, to the left of the first home screen.

27. Almost all input is given through the touch screen, which understands complex gestures using multi-touch. The iPhone's interaction techniques enable the user to move the content up or down by a touch-drag motion of the finger. For example, zooming in and out of web pages and photos is done by placing two fingers on the screen and spreading them farther apart or bringing them closer together, a gesture known as "pinching". Scrolling through a long list or menu is achieved by sliding a finger over the display from bottom to top, or vice versa to go back. In either case, the list moves as if it is pasted on the outer surface of a wheel, slowly decelerating as if affected by friction. In this way, the interface simulates the physics of a real object. Other user-centered interactive effects include horizontally sliding sub-selection, the

vertically sliding keyboard and bookmarks menu, and widgets that turn around to allow settings to be configured on the other side. Menu bars are found at the top and bottom of the screen when necessary. Their options vary by program, but always follow a consistent style motif. In menu hierarchies, a "back" button in the top-left corner of the screen displays the name of the parent folder.

**Phone**

28. When making a call, the iPhone presents a number of options, including Face Time on supported models. The screen is automatically disabled when held close to the face.The iPhone allows audio conferencing, call holding, call merging, caller ID, and integration with other cellular network features and iPhone functions. For example, if music is playing when a call is received, the music fades out, and fades back in when the call has ended. The proximity sensor shuts off the screen and touch-sensitive circuitry when the iPhone is brought close to the face, both to save battery and prevent unintentional touches. The iPhone does not support video calling or videoconferencing on versions prior to the fourth generation, as there is only one camera on the opposite side of the screen.[110] The iPhone 4 supports video calling using either the front or back camera over Wi-Fi, a feature Apple calls Face Time The first two models only support voice dialing through third-party applications. Voice control, available only on the iPhone 3GS and iPhone 4, allows users to say a contact's name or number and the iPhone will dial.

29. The iPhone includes a visual voicemail (in some countries) feature allowing users to view a list of current voicemail messages on-screen without having to call into their voicemail. Unlike most other systems, messages can be listened to and deleted in a non-chronological order by choosing any message from an on-screen list. A music ringtone feature was introduced in the United States on September 5, 2007. Users can create custom ringtones from songs purchased from the iTunes Store for a small additional fee. The ringtones can be 3 to 30 seconds long from any part of a song, can fade in and out, pause from half a second to five seconds when looped, or loop continuously. All customizing can be done in iTunes, or alternatively with Apple's GarageBand software 4.1.1 or later (available only on Mac OS X) or third-party tools.

**Multimedia**

30. The layout of the music library is similar to that of an iPod or current Symbian S60 phones. The iPhone can sort its media library by songs, artists, albums, videos, playlists, genres, composers, podcasts, audio books, and compilations. Options are always presented alphabetically, except in playlists, which retain their order from iTunes. The iPhone uses a large font that allows users plenty of room to touch their selection. Users can rotate their device horizontally to landscape mode to access Cover Flow. Like on iTunes, this feature shows the different album covers in a scroll-through photo library. Scrolling is achieved by swiping a finger across the screen.

31. Alternatively, headset controls can be used to pause, play, skip, and repeat tracks. On the iPhone 3GS, the volume can be changed with the included Apple Earphones, and the Voice Control feature can be used to identify a track, play songs in a playlist or by a specific artist, or create a playlist The iPhone supports gapless playback Like the fifth-generation iPods introduced in 2005, the iPhone can play digital

video, allowing users to watch TV shows and movies in widescreen. Double-tapping switches between widescreen and full screen video playback.

32. The iPhone allows users to purchase and download songs from the iTunes Store directly to their iPhone. The feature originally required a Wi-Fi network, but now can use the cellular data network if one is not available. The iPhone includes software that allows the user to upload, view, and e-mail photos taken with the camera. The user zooms in and out of photos by sliding two fingers further apart or closer together, much like Safari. The Camera application also lets users view the camera roll, the pictures that have been taken with the iPhone's camera. Those pictures are also available in the Photos application, along with any transferred from iPhoto or Aperture on a Mac, or Photoshop on a Windows PC.

**Internet Connectivity**

33. Internet access is available when the iPhone is connected to a local area Wi-Fi or a wide area GSM or EDGE network, both second-generation (2G) wireless data standards. The iPhone 3G introduced support for third-generation UMTS and HSDPA 3.6 but not HSUPA networks, and only the iPhone 3GS and iPhone 4 support HSDPA 7.2. AT&T introduced 3G in July 2004 but as late as 2007, Steve Jobs stated that it was still not widespread enough in the US, and the chipsets not energy efficient enough, to be included in the iPhone. Support for 802.1X, an authentication system commonly used by university and corporate Wi-Fi networks, was added in the 2.0 version update.

34. The iPhone 3GS has a maximum download rate of 7.2 Mbit/s Furthermore, files downloaded over cellular networks must be smaller than 20 MB. Larger files, often email attachments or podcasts, must be downloaded over Wi-Fi (which has no file size limits). If Wi-Fi is unavailable, one workaround is to open the files directly in Safari. Safari is the iPhone's native web browser, and it displays pages similar to its Mac and Windows counterparts.

35. Web pages may be viewed in portrait or landscape mode and supports automatic zooming by pinching together or spreading apart fingertips on the screen, or by double-tapping text or images The iPhone supports neither Flash nor Java. Consequently, the UK's Advertising Standards Authority adjudicated that an advertisement claiming the iPhone could access "all parts of the internet" should be withdrawn in its current form, on grounds of false advertising In a rare public letter in April 2010, Apple CEO Steve Jobs outlined the reasoning behind the absence of Flash on the iPhone (and iPad The iPhone supports SVG, CSS, HTML Canvas, and Bonjour. The maps application can access Google Maps in map, satellite, or hybrid form. It can also generate directions between two locations, while providing optional real-time traffic information.

36. iPhone users can and do access the Internet frequently, and in a variety of places. According to Google, in 2008, the iPhone generated 50 times more search requests than any other mobile handset. According to Deutsche Telekom CEO René Obermann, "The average Internet usage for an iPhone customer is more than 100 megabytes. This is 30 times the use for our average contract-based consumer customers Nielsen found that 98% of iPhone users use data services, and 88% use the internet In China, the iPhone 3G and iPhone 3GS were built and distributed without Wi-fi. With the introduction of the Verizon iPhone in January 2011, the issue of using

internet while on the phone has been brought to the public's attention. Under the two US carriers, internet and phone could be used simultaneously on ATT networks, whereas the Verizon networks only support for the use of each separately.

**Text Input**

37. For text input, the iPhone implements a virtual keyboard on the touch screen. It has automatic spell checking and correction, predictive word capabilities, and a dynamic dictionary that learns new words. The keyboard can predict what word the user is typing and complete it, and correct for the accidental pressing of keys near the presumed desired key The keys are somewhat larger and spaced farther apart when in landscape mode, which is supported by only a limited number of applications. Touching a section of text for a brief time brings up a magnifying glass, allowing users to place the cursor in the middle of existing text. The virtual keyboard can accommodate 21 languages, including character recognition for Chinese. The 3.0 update brought support for cut, copy, or pasting text, as well as landscape keyboards in more applications.

**E-mail and text messages**

38. The iPhone also features an e-mail program that supports HTML e-mail, which enables the user to embed photos in an e-mail message. PDF, Word, Excel, and PowerPoint attachments to mail messages can be viewed on the phone. Apple's Mobile Me platform offers push email, which emulates the functionality of the popular BlackBerry email solution, for an annual subscription. Yahoo! offers a free push-email service for the iPhone. Apple has also licensed Microsoft ActiveSync and now supports the platform (including push email) with the release of iPhone 2.0 firmware The iPhone will sync e-mail account settings over from Apple's own Mail application, Microsoft Outlook, and Microsoft Entourage, or it can be manually configured on the device itself. With the correct settings, the e-mail program can access almost any IMAP or POP3 account Text messages are presented chronologically in a mailbox format similar to Mail, which places all text from recipients together with replies. Text messages are displayed in speech bubbles (similar to iChat) under each recipient's name. The iPhone has built-in support for e-mail message forwarding, drafts, and direct internal camera-to-e-mail picture sending. Support for multi-recipient SMS was added in the software update Support for MMS was added in the 3.0 update, but not for the original iPhone and not in the U.S. until September 25, 2009.

**Third-Party Applications**

39. At WWDC 2007 on June 11, 2007, Apple announced that the iPhone would support third-party "web applications" written in Ajax that share the look and feel of the iPhone interface. On October 17, 2007, Steve Jobs, in an open letter posted to Apple's "Hot News" weblog, announced that a software development kit (SDK) would be made available to third-party developers in February 2008. The iPhone SDK was officially announced and released on March 6, 2008, at the Apple Town Hall facility. t is a free download, with an Apple registration, that allows developers to develop native applications for the iPhone and iPod Touch, then test them in an "iPhone simulator".

40. However, loading an application onto a real device is only possible after paying an Apple Developer Connection membership fee. Developers are free to set any price for their applications to be distributed through the App Store, of which they will receive a 70% share Developers can also opt to release the application for free and will not pay any costs to release or distribute the application beyond the membership fee. Before the SDK was released, third-parties were permitted to design "Web Apps" that would run through Safari. Unsigned native applications are also available for "jailbroken" phones The ability to install native applications onto the iPhone outside of the App Store is not supported by Apple, the stated reason being that such native applications could be broken by any software update, but Apple has stated it will not design software updates specifically to break native applications other than those that perform SIM unlocking in January 2011, Apple has passed 10 billion app downloads.

**Accessibility**

41. The iPhone can enlarge text to make it more accessible for vision-impaired users and can accommodate hearing-impaired users with closed captioning and external TTY devices. The iPhone 3GS also features white on black mode, VoiceOver (a screen reader), and zooming for impaired vision, and mono audio for limited hearing in one ear Apple regularly publishes Voluntary Product Accessibility Templates which explicitly state compliance with the US regulation "Section 508".